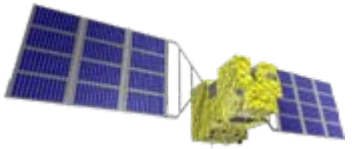

GOSAT

(Greenhouse gases Observing SATellite)
(IBUKI: breath in Japanese)

Prof. G. Inoue, RIHN
GOSAT Chief Scientist
Research Institute of Humanity and Nature, inouegen@chikyu.ac.jp
***Dr. K. O'hashi, JATIS**
****Dr. T. Yokota, NIES**

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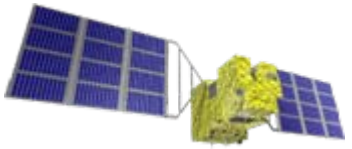


(A) GOSAT；present stage

(a) Pointing mechanism : target mode operation

(b) Spectral analysis ; 2D-CH_4 distribution

(c) Some examples ; India and China

(B) Three Steps for Monitoring of CH_4

(a) GOSAT data

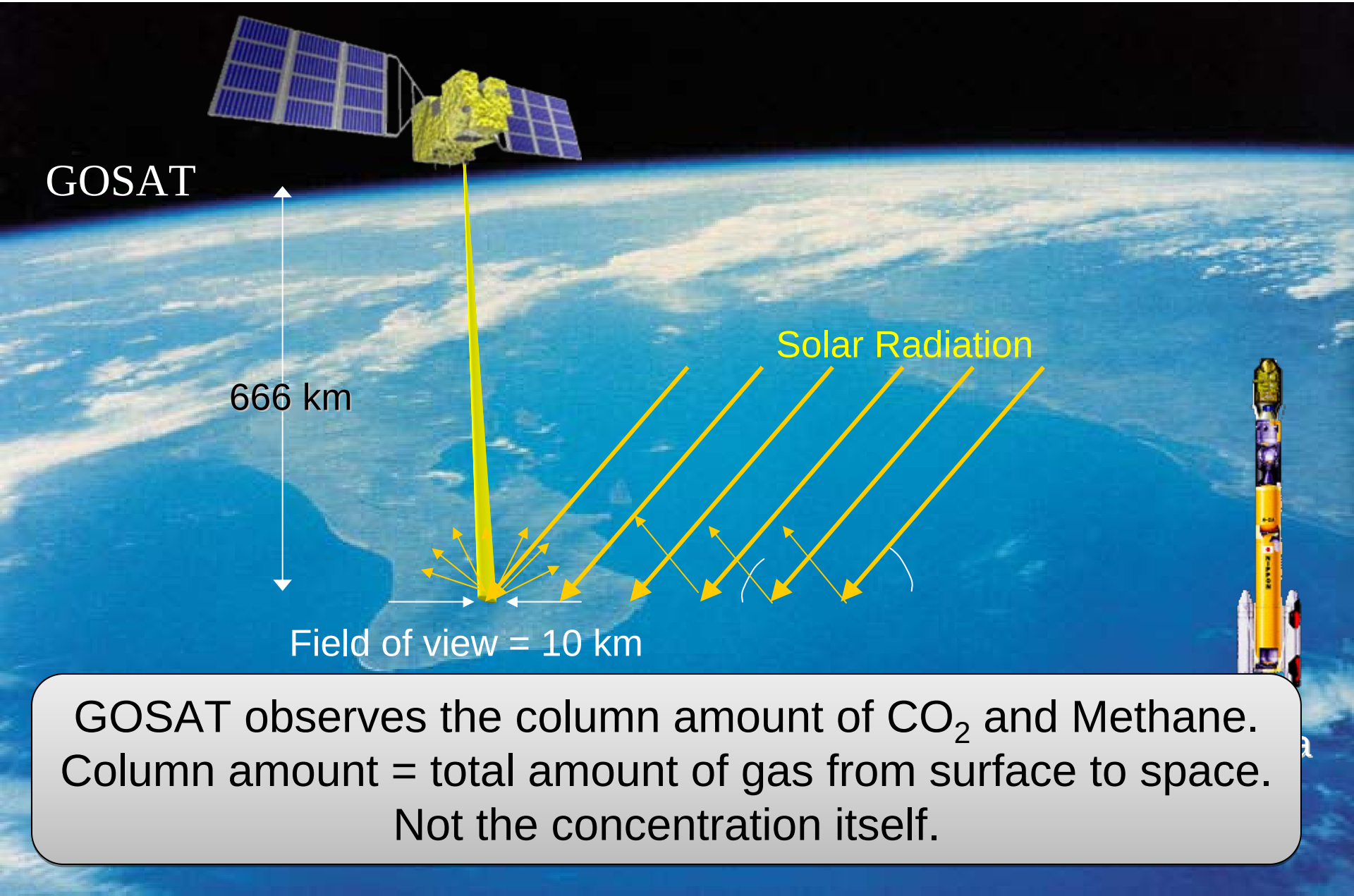
(b) Remote sensing observation from Aircraft

(c) Ground measurement

Launch of GOSAT

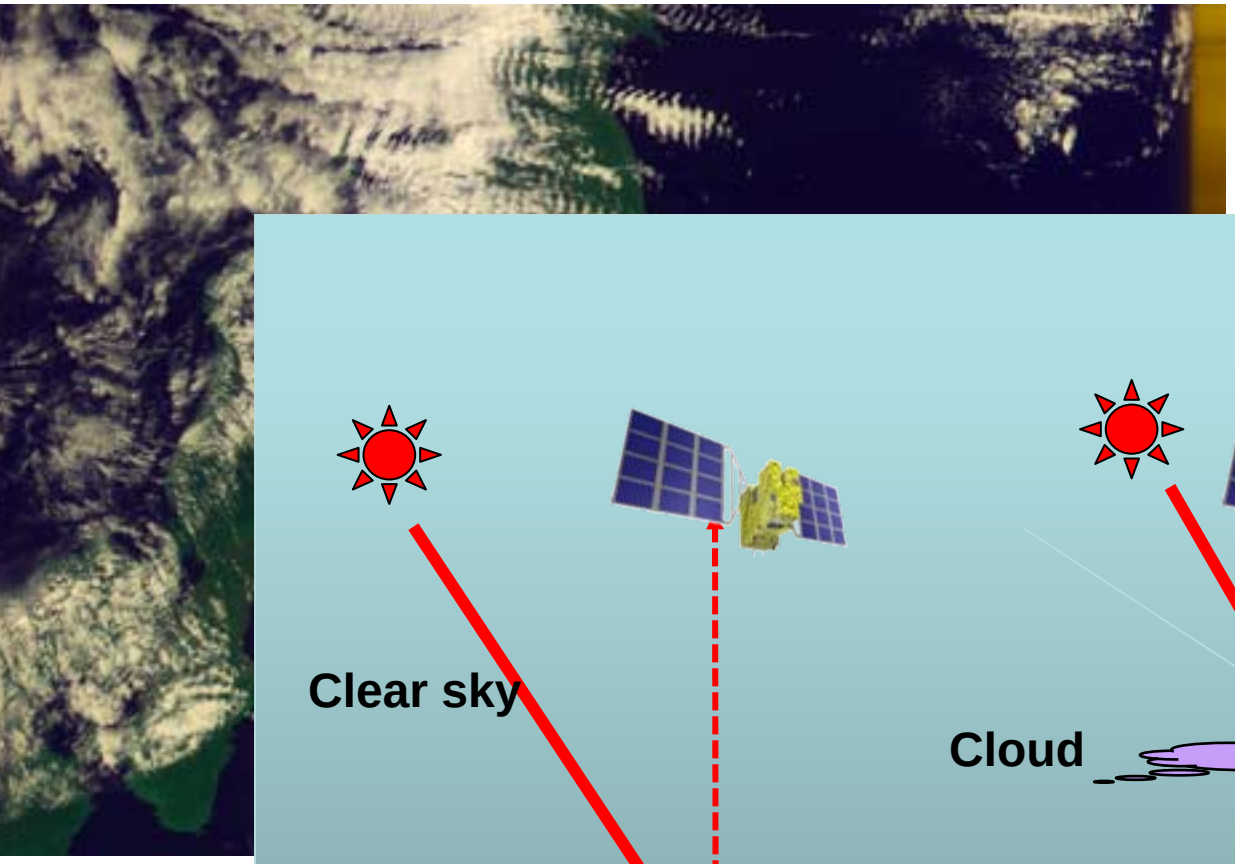
GOSAT was launched from Tanegashima (Launch Site) by H2-A rocket on 23rd January 2009.

GOSAT

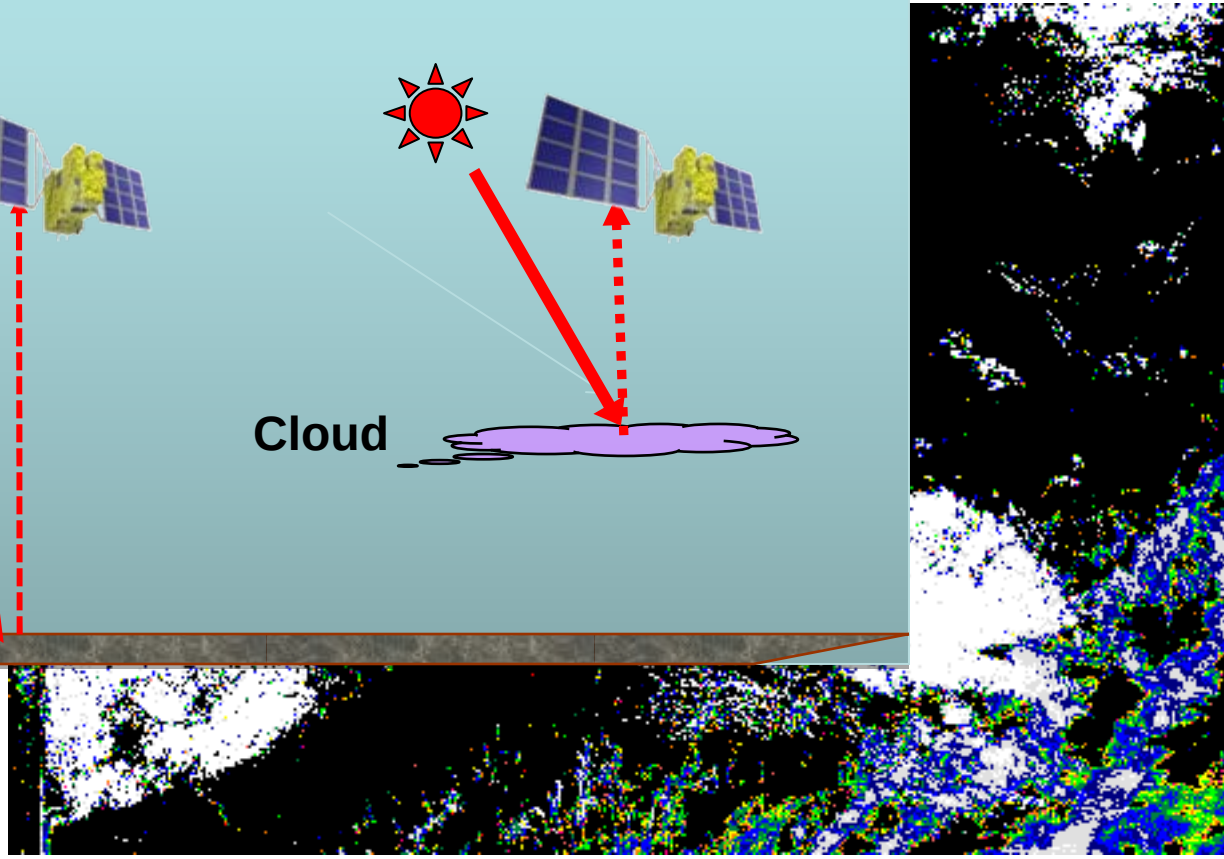


GOSAT observes the column amount of CO_2 and Methane.
Column amount = total amount of gas from surface to space.
Not the concentration itself.

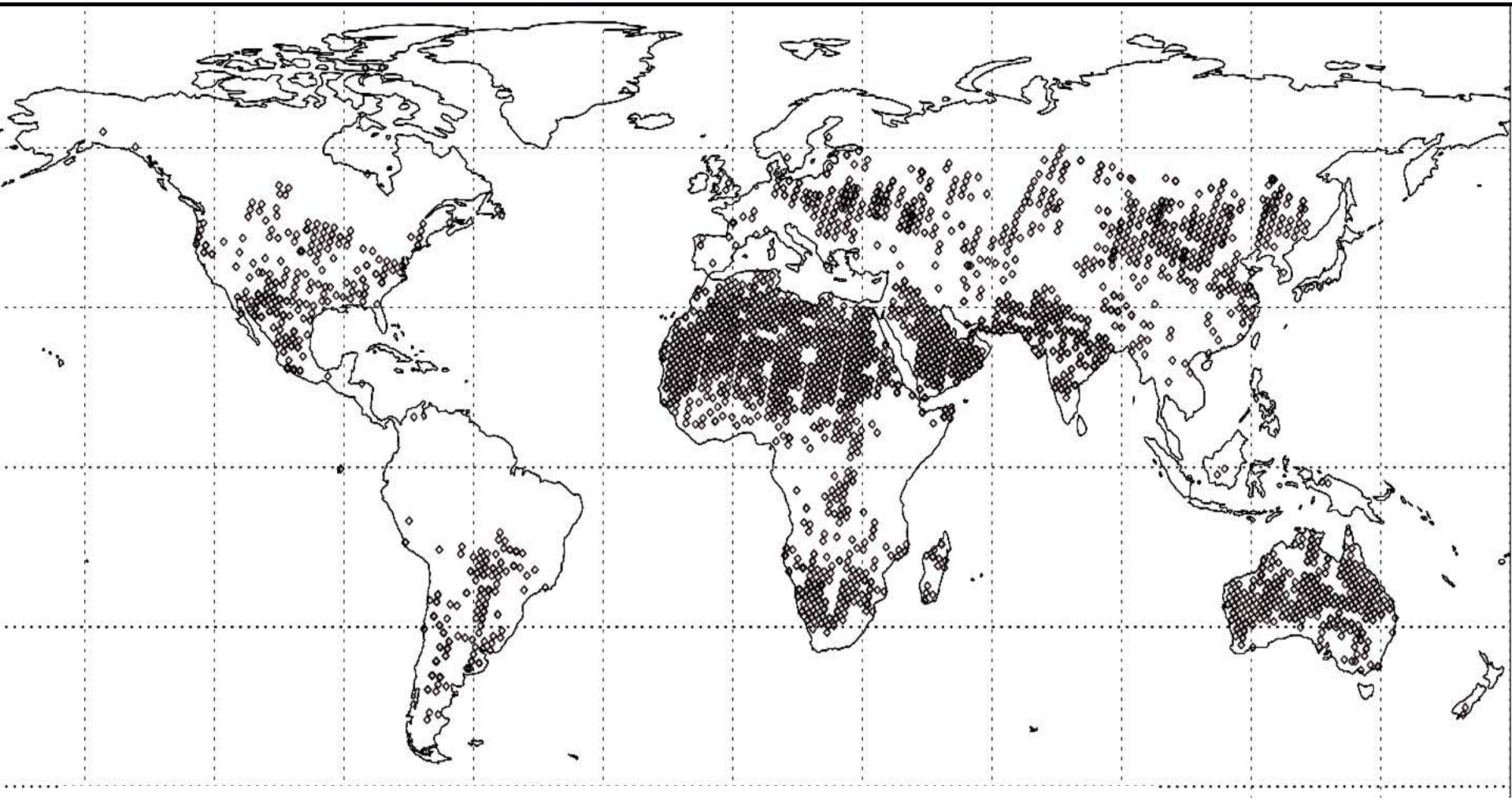
CAI Image & Cloud flag Image



April 23,2009
Japan area

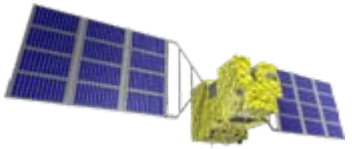


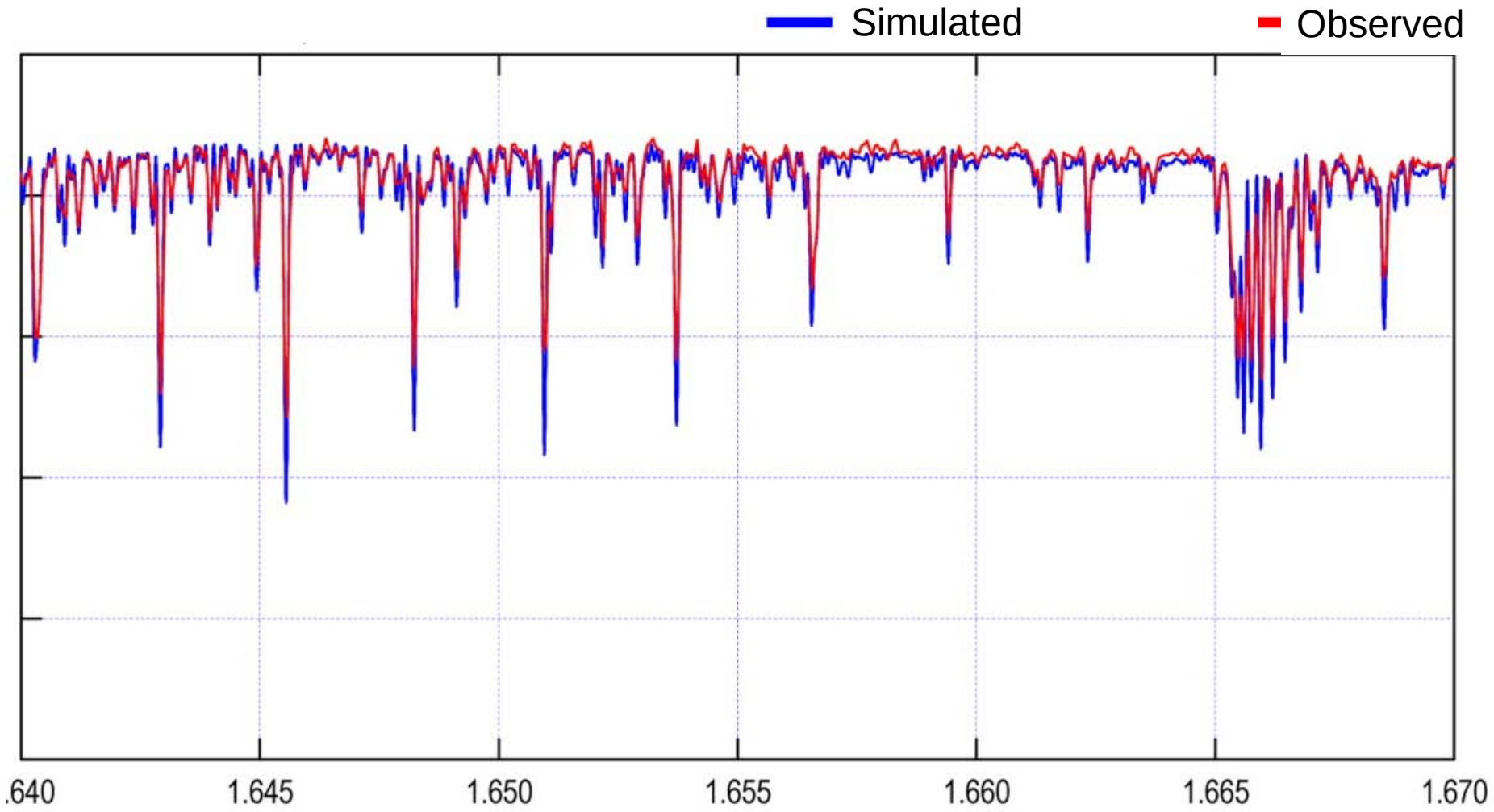
Cloud coverage in July, 2002



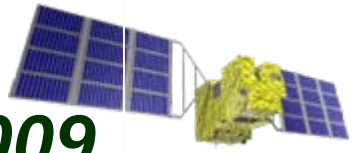
Nine days clear sky data points in April, 2009

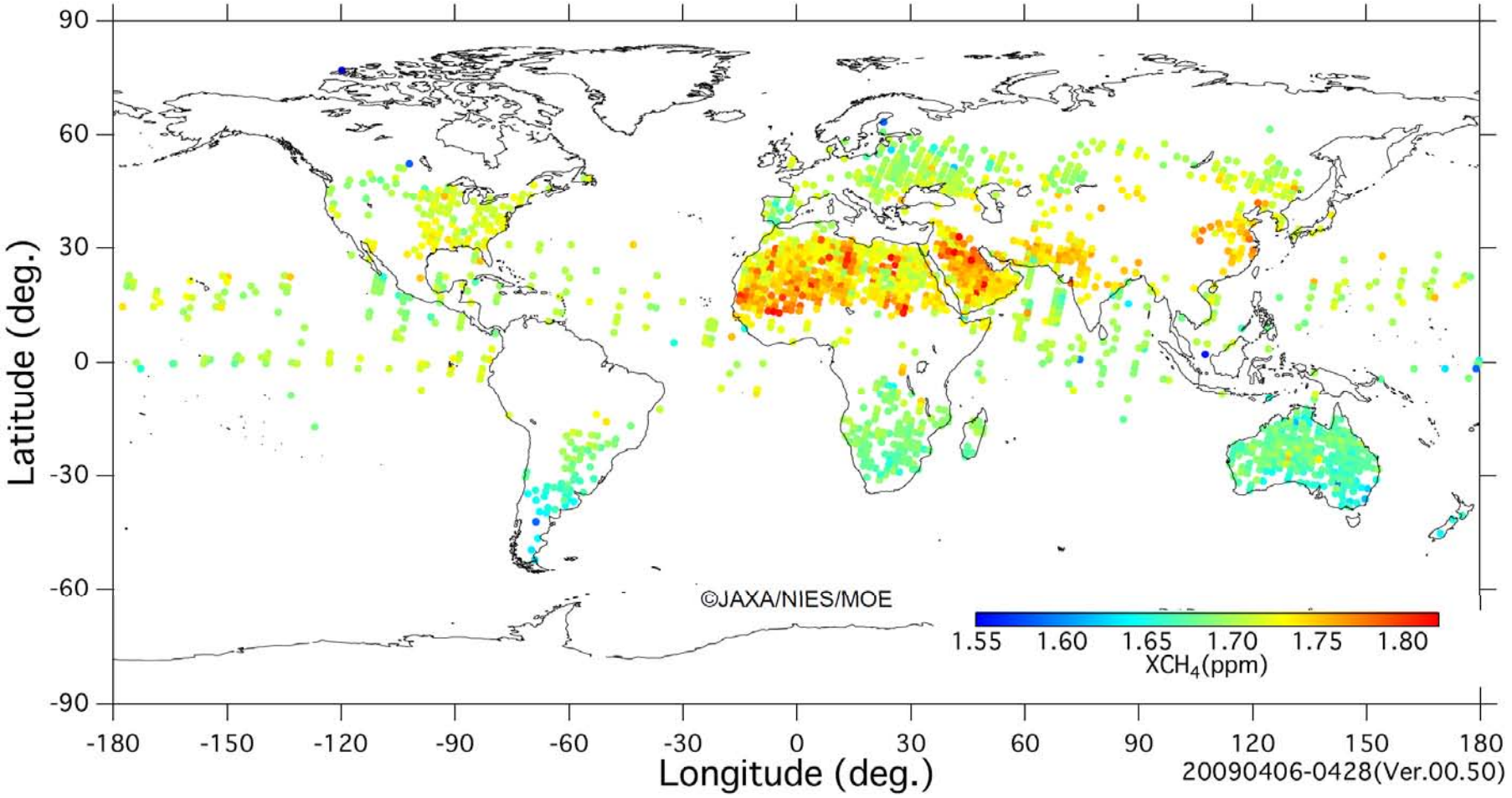
Observed and Simulated Spectrum of CH_4

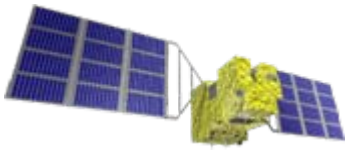




Nine days composite of CH_4 column concentration in April,2009

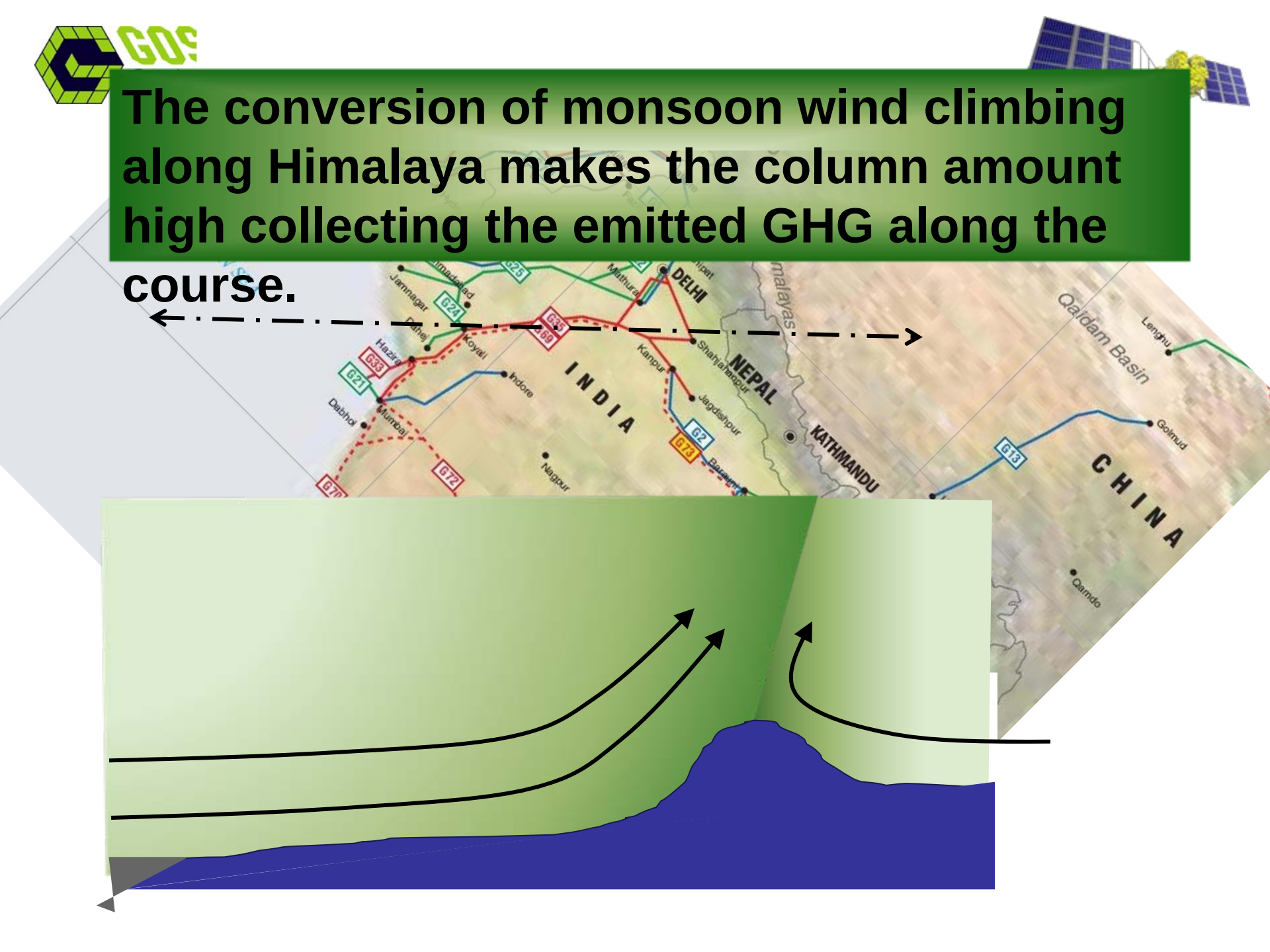




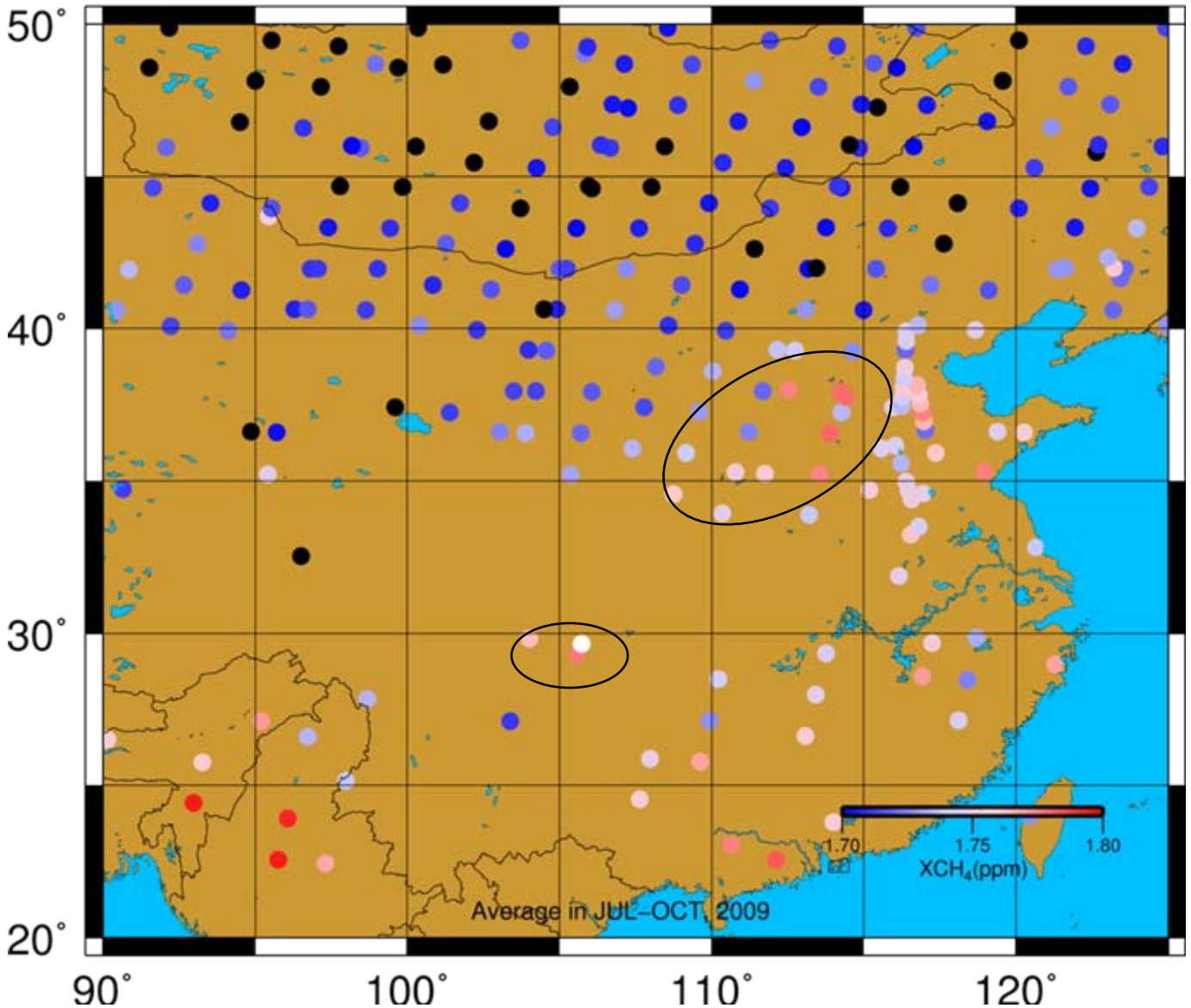


Higher concentration

The conversion of monsoon wind climbing along Himalaya makes the column amount high collecting the emitted GHG along the course.



XCH_4

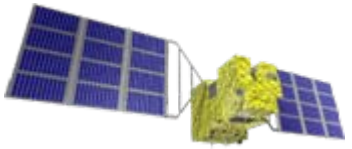


Oil & Gas

Coal

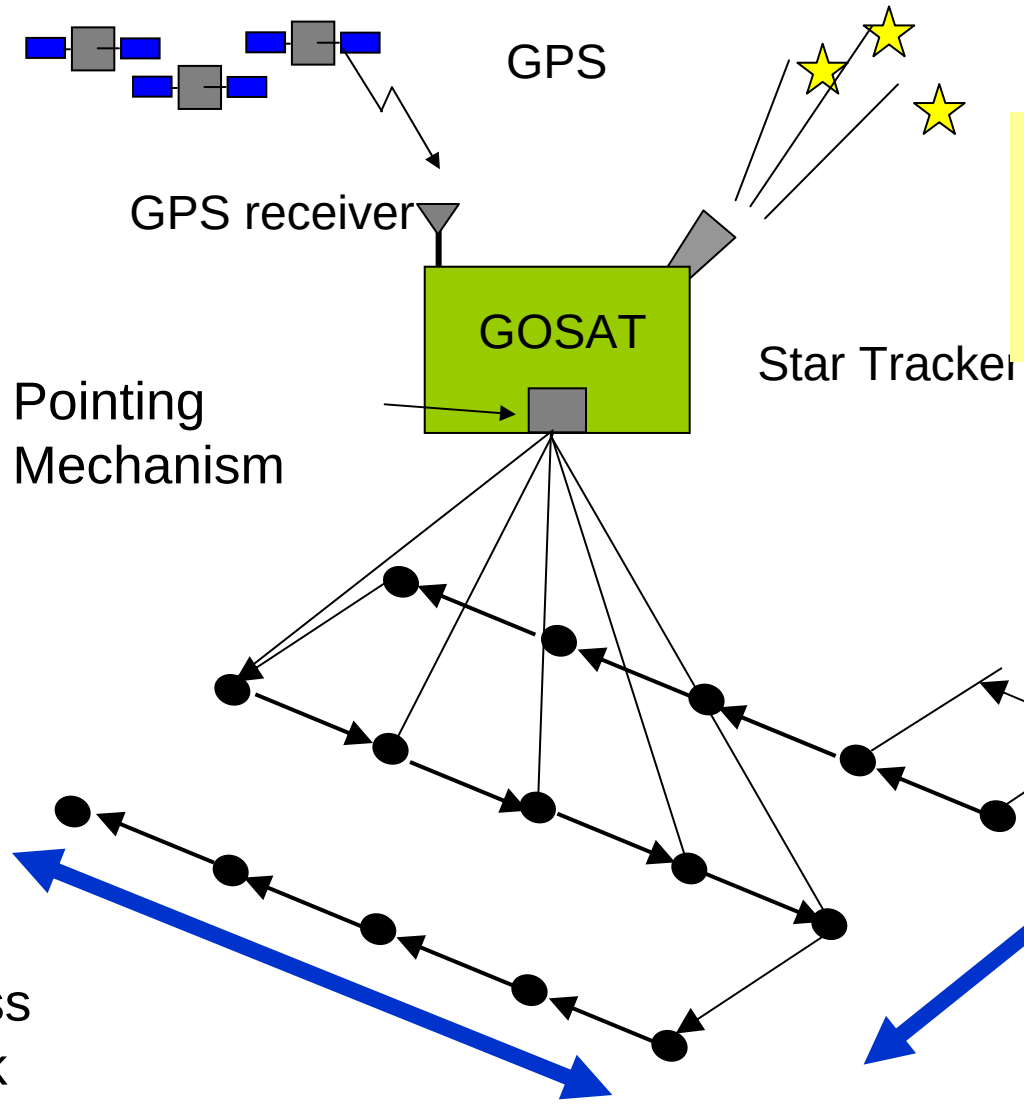
Rice

GOSAT
Greenhouse gases
Observing
SATellite



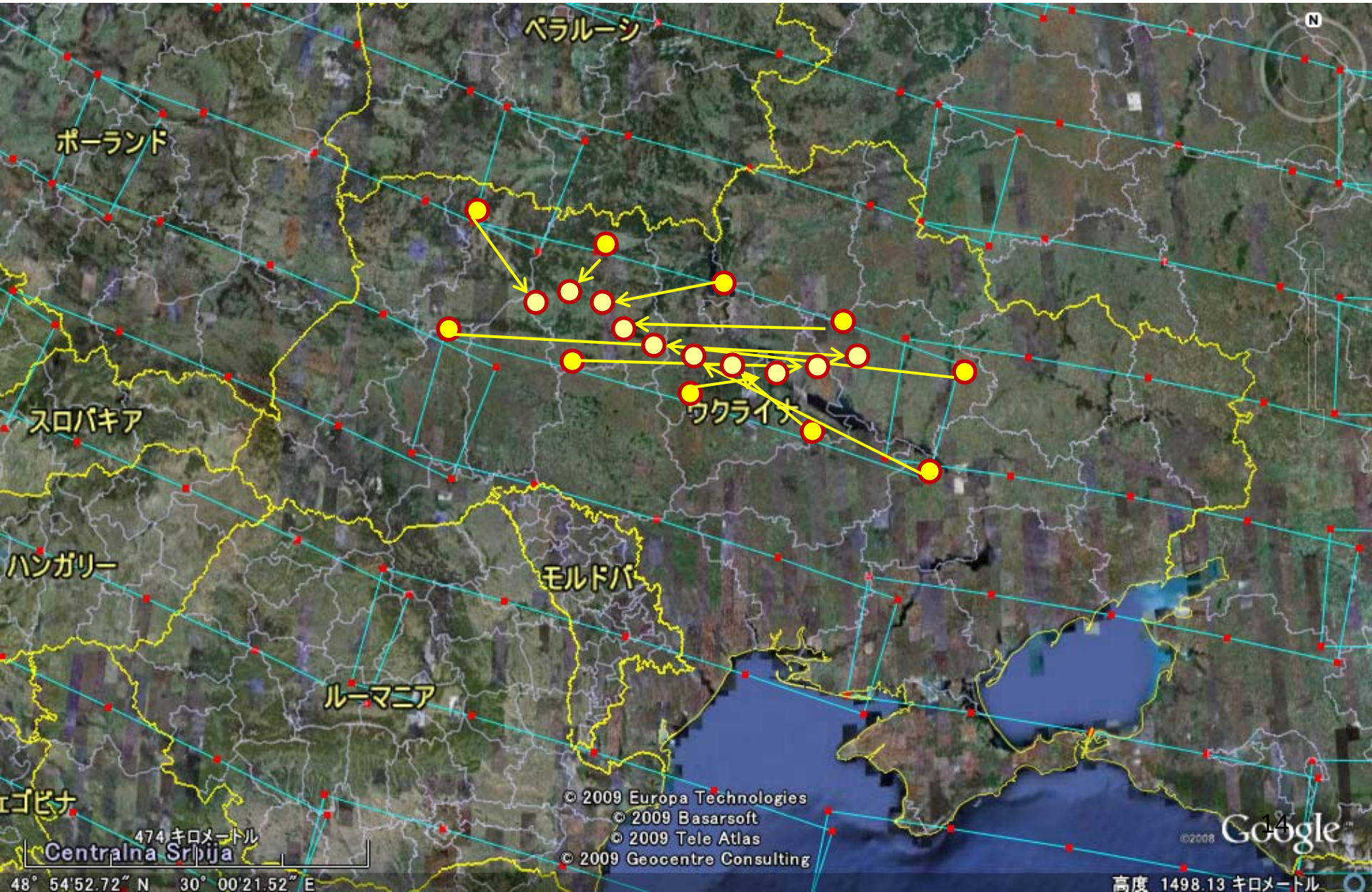
How to apply GOSAT data to the pipeline / gas-mining sites?

Foot prints in normal observation mode



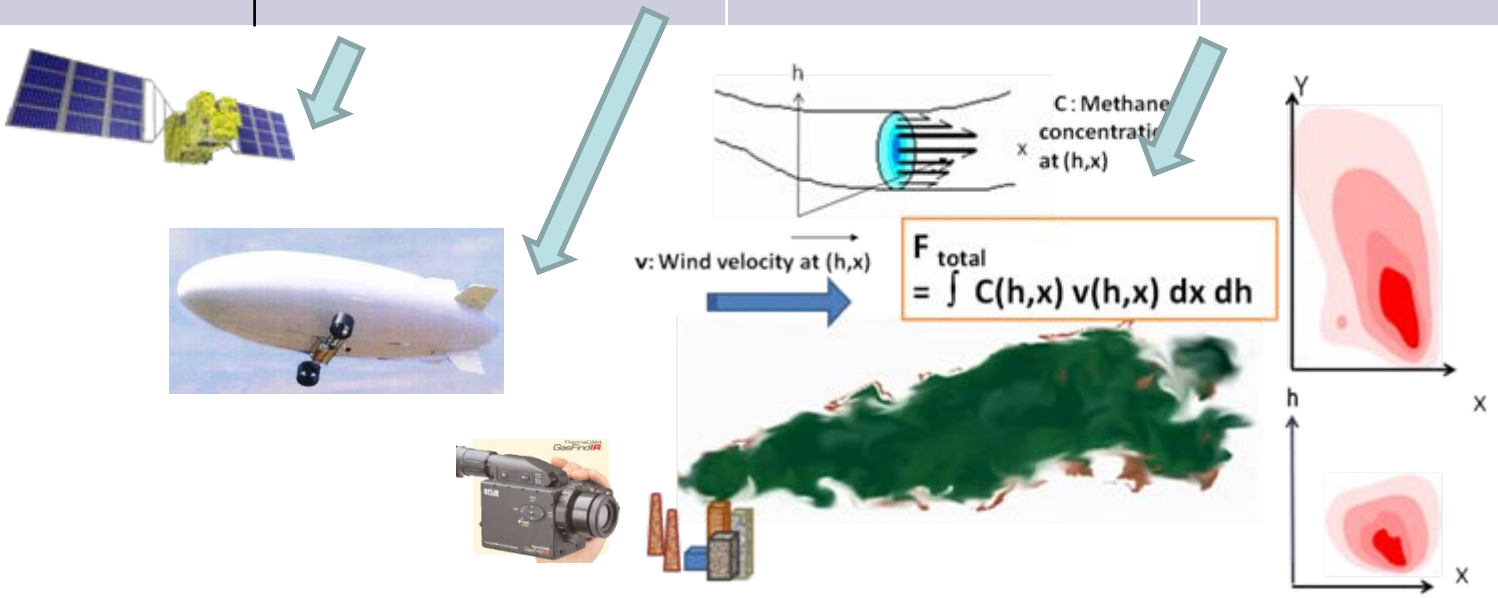
cross track patters
(normally 5 points)
4 seconds/spectrum

Operational 5-points mode to Target mode

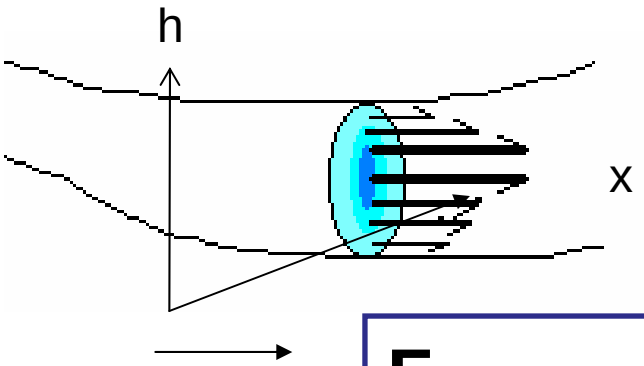


Three Steps Monitoring of CH_4

Stage 3	1 st	2 nd	3 rd
Steps	GOSAT	Sky-ship	Inside Station
Monitoring Items	Identification of leak	Location of leak points	Leaking source
Method	Satellite ⇒	Sky-ship+ Thermal viewer (or Lidar) ⇒	Thermal viewer
Frequency	Continuous Monitoring	On demand.	Planning of Rehabilitation
Resolution	10~1.000km	10~100 m	Pin Point



Leak rate from a composite source

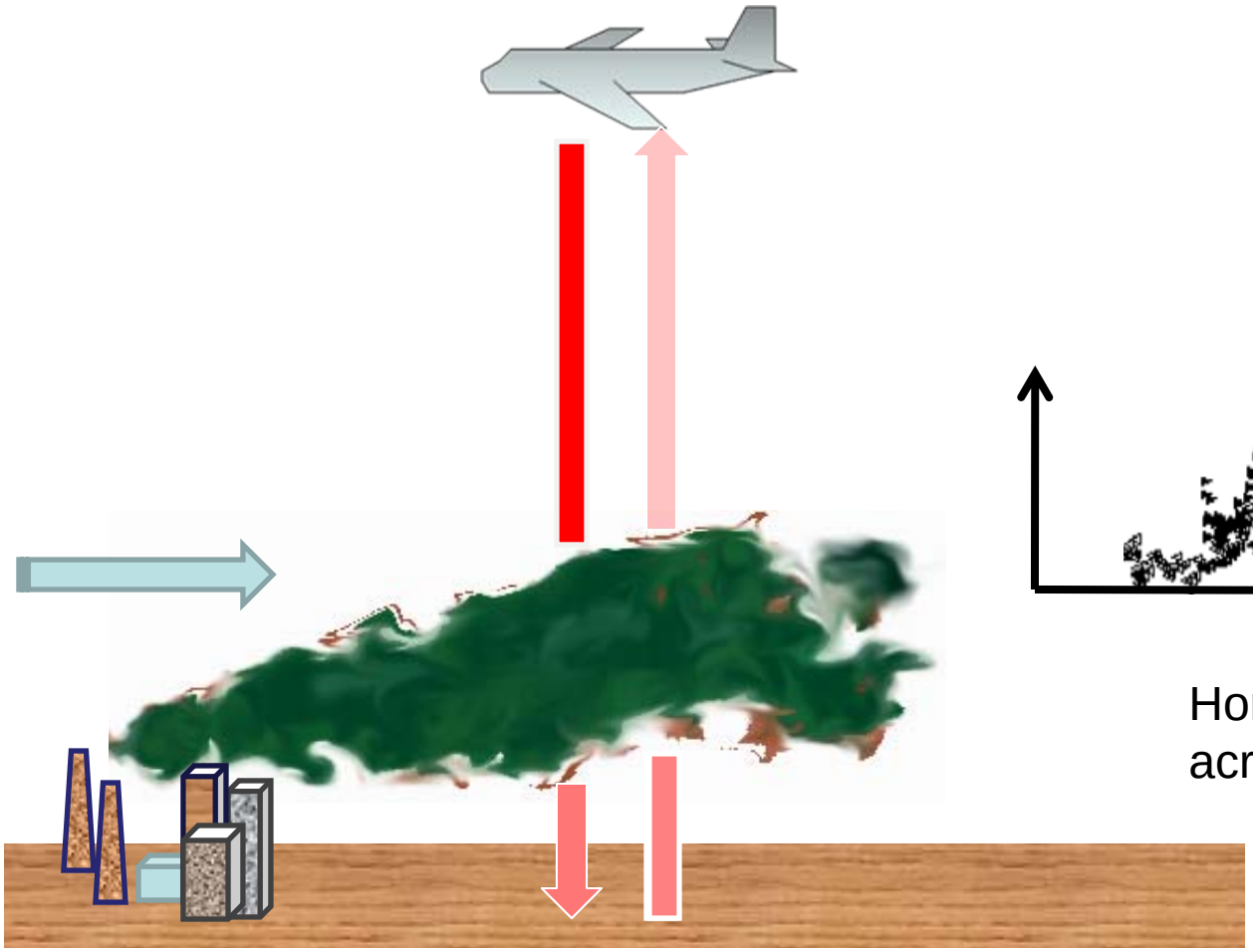


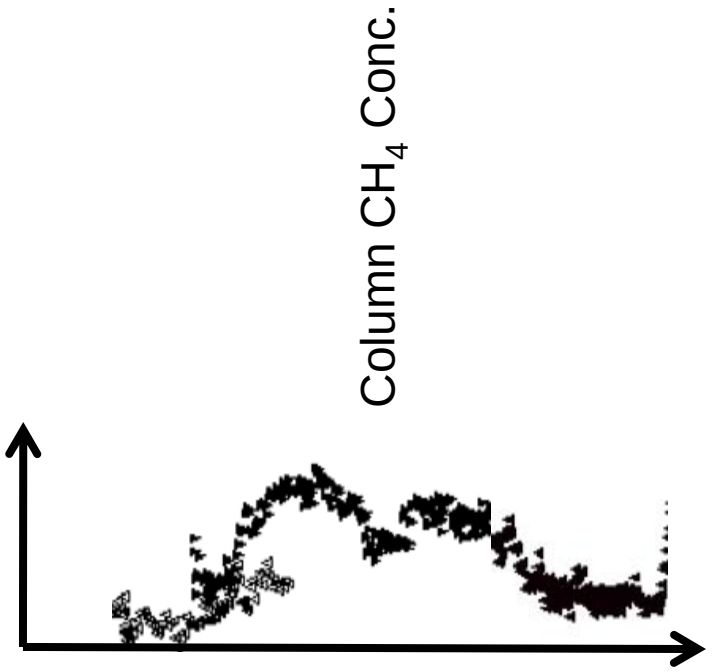
C：Methane concentration at (h,x)

v : Wind velocity at (h,x)

$$F_{total} = \int C(h,x)\, v(h,x)\, dx\, dh$$

Lidar observation from Aircraft





Possible performance

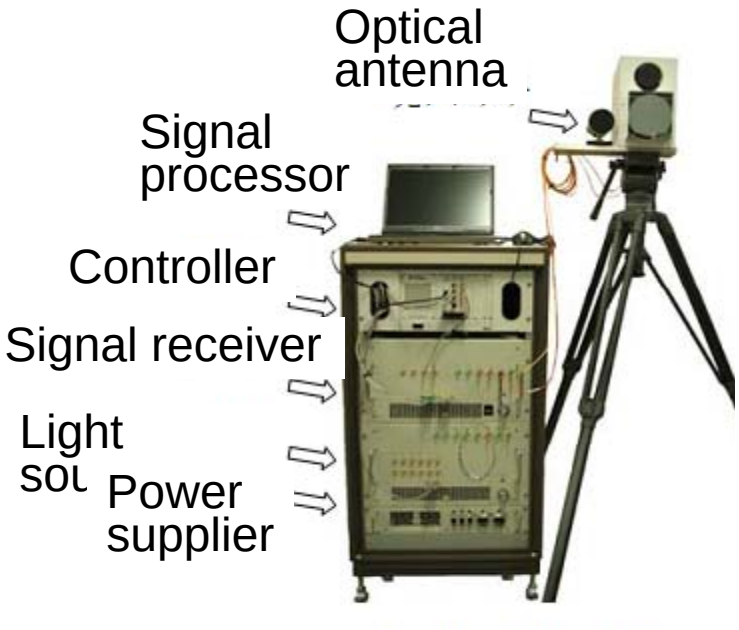
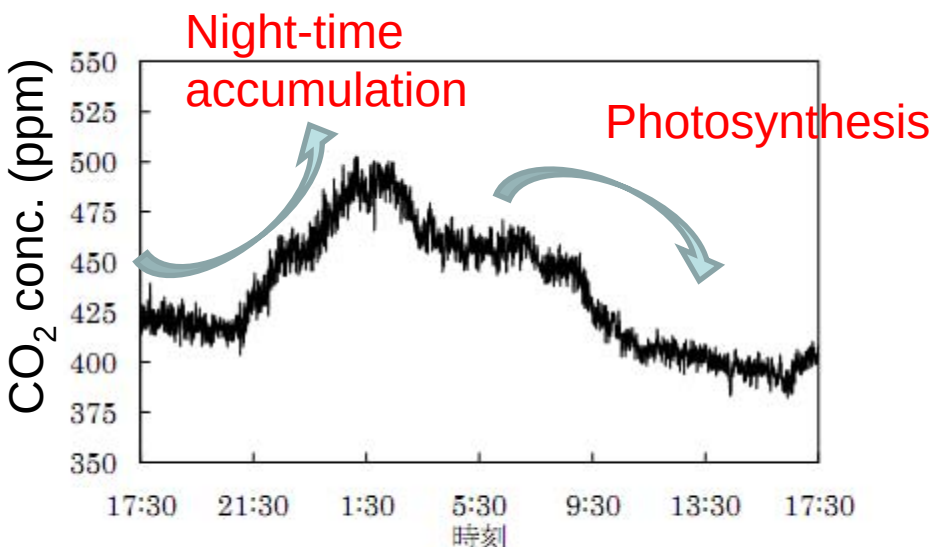


Photo of CO_2 system

Example of field observation



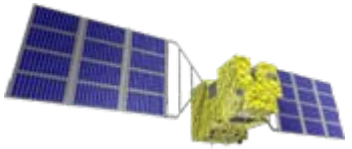
Variation of CO_2 concentration observed by our DIAL system

- Target: CO_2 (at 400 ppm)
- Distance between LIDAR and Target: 1 km
- Averaging period: 32 sec
- Precision: 4 ppm (1% of background concentration)

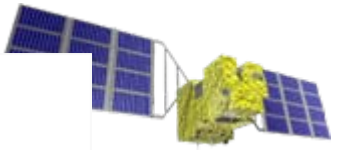
Possible usage of GOSAT data

- The data is stored in a memory system, and down-linked at Norway and Japan only.
- FTS L1A data is processed together with the housekeeping data, and converted to L1B data (spectra) in a day by JAXA, which are transferred to NIES, and distributed to users.
- NIES convert them to L2 data (concentrations) in a week, using aerosol and cloud data from GOSAT TANSO-CAI and aerosol model, and concentration from model as the initial guess.
- We can obtain the concentration pattern rather than the concentration by a quick-view analysis.

Data Policy



1. Data is fully open and free of charge in R&D.
2. In order to access to the data in early stage, it is recommended to apply to the Research Announcement (RA).
3. Special Targeting Operation can be requested by the RA users only.
4. Above items are applied as long as it is the R/D stage. Profitable application is requested to compensate the cost necessary to handle the data set.

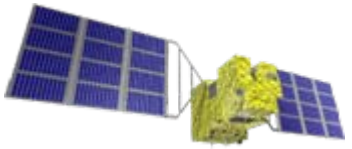


Sensitivity (GOSAT data use)

- The detectable leak rate is <u>about 10 tCH_4/day</u>.
  - (assuming averaged 5 m/hr winds)
- The spatial resolution is 10 km or more.
- One observation per three days if clear days continue.

Local Observation

Summary



- GOSAT was launched successfully.
- The quality of SWIR(NIR) bands spectra are excellent.
- The retrieved concentration patterns are reasonable for clear sky data.

- We hope GOSAT data would widely contribute to reduce the GHG emission.